

**COURSE TITLE:**

Foundations of Energy

**UNIT TITLE:**

Renewable Energy--Solar

**SECTION 1: General Information and Overview**

**Grade Level:**

9-12

**Suggested Number of Lessons:**

10-12

**Suggested Time to Complete Unit:**

10-20 Class periods

**Unit Overview:**

This unit will provide an overview of the solar industry including solar power: passive solar, active solar, solar photo-voltaic and solar thermal.

**SECTION 2: Essential Questions**

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| 1. | What are the essential differences between passive and active solar power systems and how are they best used in construction methods for new facilities? |
| 2. | What are the essential differences between Solar PV and Solar Thermal systems and the advantages and disadvantages of each system?                       |
| 3. | What advantage is there to single axis and dual axis solar power systems being used in Kentucky?   |

**SECTION 3: Major Focus**

| Technical Content<br>CTE<br>Program of Studies  | Learner Activities<br>(Enabling Knowledge<br>and Skills/Processes)   | Core Content<br>For Assessment  | Academic Expectations  |
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| <b>Construction<br/>Technology KOSSA<br/>Standard AD-002:</b><br>Demonstrate the ability<br>to learn new processes<br>and steps.<br><br><b>2.1--</b> Assess the impact<br>of various current and<br>new technologies on the<br>economy. | Using the provided PDF<br>files on the resource CD;<br>in the <i>Solar unit</i> ,<br><b>research</b> current and new<br>policies in the solar<br>energy industry.<br><br><b>Develop</b> a listing of<br>current energy trends and<br><b>describe</b> the impact on<br>our nation's energy<br>portfolio and economy at<br>both the state and<br>national level. | <b>SC-HS-4.6.1</b><br>Students will: <ul style="list-style-type: none"><li>• explain the relationships<br/>and connections between<br/>matter, energy, living<br/>systems and the physical<br/>environment;</li><li>• give examples of<br/>conservation of matter and<br/>energy.</li></ul> As matter and energy flow<br>through different<br>organizational levels (e.g.,<br>cells, organs, organisms,<br>communities) and between | <b>2.1</b> Students understand<br>scientific ways of<br>thinking and working<br>and use those methods<br>to solve real-life<br>problems. |

## FOUNDATIONS OF ENERGY—RENEWABLE ENERGY--SOLAR

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| <p><b>5.1--</b>Apply basic concepts and knowledge as it applies to energy technologies.</p> <p><b>6.2--</b>Identify ways to conserve energy.</p>  | <p><b>View</b> a video or a power point provided by the teacher on “Solar cells” and “solar panel”</p> <p><b>Identify</b> key components of the supply chain links to solar production.</p> <p><b>Discuss</b> with class how these links impact the economy.</p>   | <p>living systems and the physical environment, chemical elements are recombined in different ways. Each recombination results in storage and dissipation of energy into the environment as heat. Matter and energy are conserved in each change.</p> <p><b>DOK 3</b></p>  |   |
| <p><b>Construction Technology KOSSA Standard AD-003:</b> Implement new processes given oral instructions.</p> <p><b>21.-2.3--</b>Engaging in meaningful hands-on, minds-on conceptual based activities in the area of solar technologies.</p> | <p>Using the files on the resource CD, <b>develop</b> a presentation on the research solar technologies.</p> <p>Information will be assessed in the activity <i>Energy Source Expo</i>.</p> <p><b>Compare</b> findings with classmates and agree on definition of solar, its availability in Kentucky and future trends regionally and nationally.</p> <p><b>Conduct</b> research using resource texts, websites, brochures, booklets and NEED materials to identify and define the following terms:</p> <ul style="list-style-type: none"> <li>-PV</li> <li>-silica</li> <li>-life cycle assessment</li> <li>-pay back on investment</li> </ul> | <p><b>SC-HS-4.6.8</b><br/>Students will:</p> <ul style="list-style-type: none"> <li>• describe the connections between the functioning of the Earth system and its sources of energy (internal and external);</li> <li>• predict the consequences of changes to any component of the Earth system.</li> </ul> <p>Earth systems have sources of energy that are internal and external to the Earth. The Sun is the major external source of energy. Two primary sources of internal energy are the decay of radioactive isotopes and the gravitational energy for Earth’s original formation.</p> <p><b>DOK 3</b></p> | <p><b>2.2</b> Students identify, analyze and use patterns such as cycles and trends to understand past and present events and predict possible future events.</p> |
| <p><b>Construction Technology KOSSA Standard EA-005:</b> Display initiative.</p> <p><b>5.4--</b>Students will investigate with teacher guidance the role of solar technology in the future.</p>   | <p>Using the resource CD, <i>Solar Kit</i> and videos in the file, <b>explore</b> solar energy around the world, <b>Share</b> findings with class.</p> <p><b>Participate</b> in a team activity, identified in the student backgrounder on</p>   | <p><b>SC-HS-4.6.8</b><br/>Students will:</p> <ul style="list-style-type: none"> <li>• describe the connections between the functioning of the Earth system and its sources of energy (internal and external);</li> </ul>   | <p><b>2.3</b> Students identify and analyze systems and the ways their components work together or affect each other.</p>   |

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|  | schools going solar, <b>include</b> a review on public perspectives and laws.  | <ul style="list-style-type: none"> <li>predict the consequences of changes to any component of the Earth system.</li> </ul> <p>Earth systems have sources of energy that are internal and external to the Earth. The Sun is the major external source of energy. Two primary sources of internal energy are the decay of radioactive isotopes and the gravitational energy for Earth's original formation.</p> <p><b>DOK 3</b></p>   |  |
|  | <p><b>Develop</b> information including visuals, graphs and other display materials for exhibit and presentation on "Schools Going Solar."</p> <p><b>Evaluate</b> presentation/exhibit using a prescribed rubric.</p> <p><b>Take</b> notes on each group's presentation/exhibit.</p> | <p><b>SC-HS-4.6.8</b><br/>Students will:</p> <ul style="list-style-type: none"> <li>describe the connections between the functioning of the Earth system and its sources of energy (internal and external);</li> <li>predict the consequences of changes to any component of the Earth system.</li> </ul> <p>Earth systems have sources of energy that are internal and external to the Earth. The Sun is the major external source of energy. Two primary sources of internal energy are the decay of radioactive isotopes and the gravitational energy for Earth's original formation.</p> <p><b>DOK 3</b></p> | <p><b>2.4</b> Students use the concept of scale and scientific models to explain the organization and functioning of living and nonliving things and predict other characteristics that might be observed.</p> |

### **SECTION 4: Culminating Project with Scoring Guide**

Oral presentations made to the class. Team activity: Schools Going Solar--Design and construct a model demonstrating the skills and information learned.

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### **SCORING GUIDE:**

| <b>CATEGORY</b>     | <b>4</b>   | <b>3</b>   | <b>2</b>  | <b>1</b>   |
|---------------------|--|--|---|--|
| <b>CONTENT</b>      | EXTENSIVE-<br>CONTENT BEYOND<br>WHAT IS TAUGHT IN<br>CLASS                 | GOOD-<br>EXPLANATION<br>OF CONCEPTS<br>COVERED IN CLASS              | BASIC – WHAT<br>HAS ALREADY<br>BEEN COVERED IN<br>CLASS                     | LIMITED-<br>DOESN'T COVER<br>MATERIAL AS<br>WELL AS DONE IN<br>CLASS |
| <b>TECHNOLOGY</b>   | EXTENSIVE-<br>POWER POINT<br>WITH EXCELLENT<br>ANIMATION AND<br>PICTURES   | APPROPRIATE-<br>POWER POINT<br>HAS SOME<br>ANIMATION AND<br>PICTURES | BASIC- POWER<br>POINT WITH LITTLE<br>ANIMATION AND<br>PICTURES              | LIMITED – POWER<br>POINT WITH NO<br>ANIMATION OR<br>PICTURES         |
| <b>PRESENTATION</b> | EXCELLENT-<br>FLOWS WELL,<br>AUDIENCE VERY<br>ATTENTIVE- WELL<br>REHEARSED | GOOD – FLOWS<br>WELL<br>PARTICIPANTS<br>KNOW MATERIAL<br>WELL        | BASIC – FLOWS<br>UNEVENLY MAY<br>HAVE SOME<br>READING OF<br>NOTES OR SLIDES | LIMITED-<br>PARTICIPANTS<br>READ FROM<br>NOTES OR SLIDES             |
| <b>INTEREST</b>     | EXTENSIVE –<br>PARTICIPANTS<br>MAKE MANY<br>EXTENSIONS AND<br>EXPLANATIONS | APPROPRIATE –<br>ENCOURAGES<br>QUESTIONS<br>AND COMMENTS             | BASIC – CAN FIELD<br>SOME QUESTIONS   | LIMITED – GLAD TO<br>BE THROUGH WITH<br>THE PRESENTATION             |

### **SECTION 5: Assessment and Enabling Skills and Processes**

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| <b>Assessment:</b> | Assessment of students will be participation in building bench top solar power supply and solar thermal design challenge working in teams of four. Each student on the team will take a lead role in the project in the development of a team power point presentation of 10 -15 slides to the class. |
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### **SECTION 6: Support Materials (i.e., Resources, Technology, and Equipment)**

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| <b>A. Resources</b>                            | NEED Materials, CD and Secondary Info book. Photo-Voltaic kit  |
| <b>B. Technology</b>                           | Personal and shop tools and equipment  |
| <b>C. Websites (samples of many available)</b> | National Energy Education Development, <a href="http://WWW.NEED.ORG">WWW.NEED.ORG</a> ;<br>US Department of Energy, <a href="http://WWW.DOE.Gov">WWW.DOE.Gov</a> ;<br>Energy Information Administration, <a href="http://WWW.EIA.gov">WWW.EIA.gov</a> ;<br>Mr. Solar, <a href="http://www.mrsolar.com">www.mrsolar.com</a> |
| <b>D. Equipment</b>                            | Computer with internet access  |